

THE SORGHUM VARIETIES – MORE PROFITABLE AND SAFER FOR A CONTINUOUS CLIMATE CHANGE

Marcela STEFAN¹

¹ Ph.D., Associate Professor, Faculty of Agro-Food and Environmental Economics, The Bucharest University of Economic Studies, str. Mihail Moxa 5-7, Sector 1, Bucharest, Romania, email: stefanmarcela57@yahoo.com

Abstract

As a result of global warming and ecological conditions, the cultivation of sorghum has become an actual alternative for replacing the cultivation of corn, in the situation where water resources are becoming increasingly scarce, therefore causing the soil to become much more dry. Due to climate change, the losses in agricultural crops are estimated at 20% and new technologies that can be used to reduce these losses do not yet exist. Sorghum was grown in ancient times, for its seeds, for the extraction of the sweet juices from within its stem that is rich in sugar, and also being used as silage or green mass to feed animals. It's resistance to drought, low consumption of fertilizers and pesticides, having a more relaxed and easy harvest, as well as it's nutritional intake in food for animals, due to the fact that it contains protein and starch, are some of the advantages and benefits obtained during the cultivation of sorghum by farmers on large surface areas, in both global and local perspectives.

Keywords

Sorghum, profitability, agriculture, drought, climate changes.

Introduction

The future of agriculture is an ongoing concern for specialists in agriculture, taking into consideration the climate change in recent years with major changes that resulted in about 20% of crop losses. A very important role in this stage is attributed to genetics and amelioration, which may interfere with the process of obtaining certain varieties and hybrids that can adapt to extreme climatic conditions (Munteanu, L. and Tabara, V., 2012). Therefore, In Romania, the lack of irrigation on large corn acreage has led to a production decrease, thereby causing financial imbalances. Due to the drought, in the recent years corn production decreased, thing which became quite alarming both for humans and animal feed. In order to save this situation, specialists must develop new strategies of crops adaptation to extreme climate conditions, to introduce new technologies, to generalize the drop irrigation, to pay more special attention to the processing soil stages which have a great influence on the regime soil water; in other words, to reduce water loss from the soil. Going in this way, the culture most suitable for replacing the corn crop is the sorghum crop (Crasnean, G., 2014). Enhancing the sweet sorghum crop and its use in the animal nutrition can become a guarantee for the profitability of agricultural production with less financial efforts that can ensure a more balanced composition of feed rations.

1. The importance of sorghum culture

Sorghum, as a spring crop is more resistant to drought, being called by specialists 'the drought resistant corn' or 'the vegetable camel' named due to its root system which is well developed, largely sorghum roots can reach over 1 meter depth (Ambrosi, P., 2014). The sorghum stem has 1 to 3 meters height, being full with marrow and containing 9 to 15 internodes. The stems capability to sprig is high, which gives a good quality feed. Inflorescence is a panicle with ramifications that are either longer or shorter, depending on the variety. In a panicle there are

over 1.500 flowers. At the beginning of the vegetation period, in the first 2-3 weeks after emergence, the growth rate of sorghum plants is very slow, having a poor competitiveness against weeds. After this period, the growth is very strong and the danger of weeding is reduced. Sorghum still belongs to the Gramineae family, a type of Sorghum. This sort includes many annual and perennial species, of which the most outstanding is the Sorghum bicolor, in turn having several varieties of its own, such as:

- Sorghum bicolor var. eusorghum, grain sorghum;
- Sorghum b. var. technicum, technical or broom sorghum;
- Sorghum b. var. saccharatum, sweet sorghum;
- Sorghum b. var. sudanense, sorghum silage.

Worldwide, sorghum is the fifth cultivated crop after wheat, barley, corn and rice. Sorghum is grown in over 90 countries across 5 continents, between 25 degrees South latitude and 55 degrees North latitude, on about 14 million hectares. The sorghum crop is widespread, occupying large areas in Africa, Australia, China and U.S.A. The main sorghum producing countries are Nigeria, India, Argentina, Mexico and U.S.A., this being due to the fact that these are countries situated in extremely dry areas of the planet. World sorghum production is estimated around 64 million tons per year. In Europe, this sorghum crop occupies only 1,7% of the global area and the production is about 600 thousand tons of sorghum grains, but the European consumption demand is 1.2 million tons per year. The sorghum difference which should be imported is 600 thousand tons per year which is equivalent of 100 thousand hectares and these hectares could be grown by Romanian farmers.

Romania ranks the 3rd place in the sorghum acreage in Europe, with an area of approximately 22 million hectares cultivated with sorghum in 2014. Therefore, in Romania sorghum can be a potential marketplace for Spain and Hungary, because in these countries there are a lot of animal breeders, in particular of swine, interested to buy sorghum from European countries. Sorghum can represent another market for the bioethanol production which is widely used in factors from Spain, France and Italy.

Table 1 The main sorghum producing countries in Europe

Country	Cultivated areas (hectares)
France	100,000
Italy	35,000
Romania	22,000
Spain	7,000
Hungary	5,000

Source: INSSE - National Institute of Statistics

The first areas planted with sorghum in Romania and imported from the US were recorded in 1960. The low adaptation of U.S. hybrids and the delayed maturation have determinate the inclusion of sorghum and corn in a program of improvements at the Fundulea Institute for Corn Culture that had as main objectives precocity, increasing the production capacity, soil alkalinity and salinity tolerance, increasing the tolerance to pest and diseases attacks. As a result of this program were noted hybrids such as Fundulea 21, Fundulea 30, Fundulea 32 and also sorghum hybrids x Sudan grass, being very productive and better capitalizing sandy and salty soils.

The area's most favourable for sorghum crops are in the plains of southern Muntenia and Oltenia, Banat Plain and Central Plain of Moldavia, with largely the same area of distribution as corn. Sorghum grain makes, under optimal technological conditions, between 40 to 50 thousand tons / hectares.

Table 2 The Romanian cultivated areas and production obtained with sorghum between 2010 and 2014

Years	Cultivated areas (hectares)	Production (tons)
2010	10,283	18,667
2011	13,081	39,696
2012	19,992	37,481
2013	21,668	49,829
2014	18,845	51,543

Source: INSSE - National Institute of Statistics

From Table 2 it can be seen that both the surface and the production of sorghum in Romania has increased in the last 5 years due to Romanian farmers which have realized that the sorghum crop can become a sure guaranty for the profitability of agricultural production, production that can be obtained with less financial efforts and can ensure a more balanced composition of feed rations.

In Romania, the interest of farmers for this culture is growing. If in 1990 only 200 hectares of sorghum have been cultivated, today the area has reached of about 22 thousands hectares of cultivated sorghum. Many farmers have started to cultivate sorghum in the beginning of started from an area of 10 hectares; this area has increased from year to year due to the benefits obtained through breeding. A good example is a farmer from Arges country, which has 180 Holstein cows, and beef cattle Charolaise. He has cultivated sorghum silage for 3 years, starting with 10 hectares and then in subsequent years reaching 100 hectares. Sorghum silage feed is used in dairy cows all year, and winter feeding cattle meat only because the rest of the year (9 months) there are sitting on grazing cattle. The farmer believes that sorghum silage nutritive qualities are much better than corn because they are sweet, and the animals are eating sorghum with better appetite, increasing milk production (Voicu, I., et al., 2001). If a dairy cow is eating daily maximum 28-30 kg corn silage, in the case of sorghum silage the cow gets to consume about 38-40 kg per day, thereby completed food needs of forage ration of a cow. These examples are numerous for animals and birds consumption.

2. The use of sorghum

Sorghum is a cereal which guarantees the obtaining a more balanced feed rations for the feeding of poultry, cattle and swine, due to its low fiber and tannin content, and its higher protein and fat content. Furthermore, sorghum is very rich in tryptophan (a compound which stimulates the appetite) (Patrichi, V., 2001). The percentage of sorghum integration in the animal feed is between 25% and 100%. For a better digestibility is recommended a grain mixed with sorghum.

For the fact that sorghum does not contain gluten, it has a greater importance in human nutrition because lately it has been found that gluten causes a variety of allergies. The sorghum seeds like the rice ones are very tasty and represent a healthy diet. Sorghum flour can be used in bakery products and for producing alcoholic beverages. Sorghum syrup tastes like honey or maple syrup. The juice of sweet sorghum contains sucrose, fructose and glucose, much more it can be turned into ethanol. After fermentation, the mash of sorghum can be composted and used as fertilizer.

The residues from processing strain can be used for the animal nutrition or can be burned for heating, or to produce electricity. In U.S.A., sorghum together with corn, are used in the ethanol production. The ethanol production from sorghum is equivalent with the ethanol production from corn. Also, from sorghum it can be obtained brooms, straws, stems from which can be made blocks of isolation, stationary and textile cellulose, and plastics materials.

Sorghum for grains gives high yields production and is chemically very similar to corn grains. In Romania sorghum grains are used also in brewing or in other branches of food industry (Antohe I. et al., 2003).

Sorghum for biomass has very high plants approximately 330 centimeters. It has an excellent tolerance to drought conditions and is suitable for poor soils. In drought conditions, with little than 300 millimeters of rainfall, sorghum can produce more biogas than corn does. It also has higher sugar content, approximately 12% more than corn. Furthermore, it is an excellent choice for the rotation with corns in the biogas production.

Conclusions

In order to have adapted crops to the drought conditions and excess moisture, the genetic background of plant varieties should be improved and technological research should place emphasis on drought resistance and sustainable use of water and soil.

The sorghum culture can be achieved with less costs and efforts compared with the corn culture. Enhancing the sweet sorghum crop and its use in food, the ruminants as silage mass can guarantee a balanced composition of rations.

The profitability of sorghum crop is due to the fact that it is a culture with a reduced need for fertilizers and pesticides and can be grown on soils low in potassium and also can act as a "pump nitrogen" because of its well-developed root system.

Currently in Romania, cultivating sorghum is not subsidized by the state. However, considering the many advantages it can provide this crop, the state should make more effort to encourage sorghum cultivation by the farmers.

References

1. Antohe I. et al. (2003). The sorghum culture and its total industrialization. Perspective for a sustainable development in Romanian agriculture. Bucharest.
2. Ambrosi, P. (2014). The forage based. Agricultural Profit Magazine, nr. 14, pp 45-46.
3. Crasnean, G. (2014). The cultivation technology of sorghum. Agromonitor. [online] Available from: <<http://www.agromonitor.ro/tehnologia-de-cultura-a-sorgului/>>.
4. Drăghici, I. et al. (2010). The cultivation technology of hybrid sorghum for grains on irrigated sandy soils. The Research Station and Development of Plant Culture on Dăbuleni Sands,, pp 2-5.
5. Dragomir, N. (2009). Sorghum – Bicolor sorghum. Farm Magazine, nr.3. [online]. Available from: <<http://www.revista-ferma.ro/articole-tehnologii-agricole/sorgul-sorghum-bicolor-l-moench.html>>.
6. Mihai, M. (2011). September in the yield of big culture. Farmer Magazine. [online]. Available from: <<http://www.revistafermierului.ro/cultura-mare/septembrie-in-cultura-mare-3108.html>>.
7. Munteanu, L. and Tabara, V. (2012). Influence of culture on technology grain sorghum (sorghum b. var. Eurosorghum) in the experimental field from răcășdia. Research Journal of Agricultural Science 44.1, pp 109-111.
8. Patrichi, V. (2001). Sorghum - a miracle plant for livestock. Agricultural Profit Magazine, nr. 5, pp 34-36.
9. Stroe, G. (2012). The Euralis Sorghum hybrid has made performance in Romania southern countries farms. Farm Magazine, nr.13. [online] Available from: <<http://www.revista-ferma.ro/articole-agronomie/sorgul-hibrid-euralis-a-facut-performanta-in-fermele-din-sudul-tarii.html>>.
10. Voicu, I., et al. (2001). Assessing the energy and protein potential of new hybrids of plants which are resistant at drought (sweet sorghum silage).